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1.	Your reference	KWN/C615/U
2.	Patent application number *(The Patent Office will fill in this part)*	0427756.2
3.	Full name, address and postcode of the or of each applicant *(underline all surnames)*	United Wire Limited Granton Park Avenue Granton Edinburgh Scotland EH5 1HT
	Patents ADP number *(if you know it)*	5146931004
	If the applicant is a corporate body, give the country/state of its incorporation	England
4.	Title of the invention	Improvements in and relating to sifting screens
5.	Name of your agent *(if you have one)*	KEITH W NASH & CO
	"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*	90-92 Regent Street Cambridge CB2 1DP
	Patents ADP number *(if you know it)*	1206001
6.	Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months	Country / Priority application number *(if you know it)* / Date of filing *(day / month / year)*
7.	Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note f)	Number of earlier applications / Date of filing *(day / month / year)*
8.	Is a Patents Form 7/77 (Statement of Inventorship and of right to grant of a patent) required in support of this request? Answer YES if: *a) any applicant named in part 3 is not an inventor, or* *b) there is an inventor who is not named as an applicant, or* *c) any named applicant is a corporate body:* *Otherwise answer NO (See note d)*	Yes

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Description	8
Claims(s)	
Abstract	
Drawing(s)	3+8

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Translations of priority documents	-
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	1
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature(s) KEITH W NASH & CO Date 17.12.04

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom — Keith W Nash 01223 355477

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C615/Ũ

Title: Improvements in and relating to sifting screens

Field of Invention

This invention concerns sifting screens such as are fitted in shakers which are employed to separate solids from liquids, and in particular to separate solids from liquid drilling muds brought up from down-hole when drilling for oil or gas.

Background to the Invention

Historically such screens have been constructed from sheets of woven wire mesh stretched over and secured to metal frames using a polymer adhesive. Typically the frames are generally rectangular and define one or more rectangular openings over which the wire mesh is stretched.

Usually two or more layers of wire mesh having different mesh sizes have been secured to each metal frame. The tensions in the warp and weft wires of one mesh are normally greater than the corresponding warp and weft wire tensions in the other mesh.

Forms of frame

Such constructions tended to result in relatively heavy screens and since they are typically man-handled into position a new design of frame was introduced some years ago by the Applicant Company. This was constructed largely from a GRP polymer moulding in which a wire-frame is embodied during the moulding process, to reinforce the final structure and introduce sufficient rigidity to not only contain and preserve the tensions in the wire meshes, but also to ensure that the frames did not bend under the weight of the

relatively dense slurry making up the drilling mud and the build-up of solids on the screen in use.

This design of screen was ideally suited to shakers such as the VSM range of shakers supplied by Rig Technology Ltd. of Aberdeen, Scotland, UK.

The throughput of a shaker screen is dictated at least in part by the area of the screen mesh onto which the drilling mud is deposited in use. Since the area of each rectangular frame was dictated in part by the maximum permitted weight of the final screen, filtering areas greater than that of a single screen were created by arranging two or four screens in edge to edge abutment in a rectilinear rigid basket, having edge supports on which edges of the screens rested. The screens were held in place by clamps and preferably an inflatable clamping mechanism was employed to clamp the edge of the screens onto the edge supports of the rigid basket. The inflatable clamping also ensured a good liquid-tight seal around the edges of the screens.

Other shakers have been developed which accommodate large area but less well supported screens, and it has been proposed to construct such screens using wire-frame reinforced GRP frames, but after testing prototypes they were found not to have sufficient stiffness to perform in the field.

In particular the larger area GRP wire-frame reinforced screens were observed to whip violently around the centre of the unsupported span. This resulted in the screen becoming separated from edge supports to which it should remain sealed at all times in use. This allowed slurry to bypass the screen and drop into the sump reserved for filtered liquids.

In addition the whipping of the screen onto the edge supports resulted in damage to the underside of the screen frame.

Furthermore, excessive whipping caused considerable splashing of slurry over the walls of the basket and onto the floor on which the shaker was mounted. Quite apart from loss of

relatively expensive drilling muds, the chemicals making up the muds are not such as should be dumped at sea. Therefore any such splashing could result in environmental contamination and serious penalties for rig-operators if any such spillages are not collected and disposed of correctly, all of which increased the cost of processing and recovering the down-hole mud.

It is therefore an object of the present invention to provide an improved form of relatively light-weight frame construction which is sufficiently rigid as not to whip excessively in use and can span larger screening areas than the previously produced wire reinforced GRP framed screens.

Summary of the invention

According to one aspect o the present invention a frame over which woven wire mesh is to be stretched and secured to form a sieving screen which can be used to screen solids from drilling mud recovered from down-hole when drilling for oil or gas comprises a rectilinear moulded plastics frame having edges by which it is secured in place in a shaker and defining a plurality of rectilinear windows formed by an orthogonal array of intersecting ribs within which is embedded a reinforcing structure comprising two spaced apart layers of orthogonally intersecting spaced apart wires, running parallel to the length and breadth of the rectilinear shape of the frame to increase its rigidity and a rigid rectangular bounding frame to which the ends of the wires are secured and between parallel spaced apart edges of which they extend.

Preferably the rigid rectangular bounding frame is encapsulated in the same plastics material as forms the moulded orthogonal array of intersecting ribs, to form a moulded bounding frame for the ribs which therefore also extend between and are integral with the encapsulated edges of the bounding frame.

Preferably the bounding frame is constructed from metal hollow box section material.

The rectangular perimeter of the resulting screen is therefore a substantial rigid structure which will not whip when vibrated in use in a shaker and is sufficiently strong to resist bending or deformation due to mesh wire tension and can span larger areas than the reinforced GRP screens previously developed for the Rig Technology VSM series of shakers.

In use the perimeter of the screen is sealed within the shaker to prevent seepage of liquid therearound, and the rigid perimeter section can provide sufficient strength to eliminate the separation that can occur between the frame and seal due to whipping, and will thus solve the fluid bypass and seal damage issues. The rigid perimeter also acts as additional support to the internal wire grid structure, and this reduces the relative deflection of the grid to such an extent that the excessive splashing problem will also be reduced if not eliminated.

The Box-section perimeter reinforcing frame may have a square or rectangular cross-section.

According to other aspects of the present invention the grid of reinforcing wires may be replaced by a grid of flat metal bar, or of metal bar having an I-beam section.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is an exploded perspective view of part of a known screen,

Fig. 2 is a scrap section of the upper end of one of the intersecting array of ribs in the known frame showing a reinforcing wire embedded in the moulded GRP material,

Fig. 3 is a perspective view of the welded wire reinforcement grid employed in the manufacture of the known screen,

Fig. 4 is a cross-section through one of the ribs of Fig. 1 showing both upper and lower wires,

Fig. 5 is a cross-section through a rib of a screen embodying a flat bar reinforcement in place of the wires, according to one of the aspects of the present invention,

Fig. 6 is a similar view that of Fig. 5 showing an I-beam section bar in place of the wires, according to another aspect of the present invention,

Fig. 7 is a cross-section through the outer perimeter of a frame constructed in accordance with the first aspect of the present invention, in which the box section is square,

Fig. 8 shows one technique for securing a screen in a shaker,

Fig. 9 shows another technique for securing a screen in a shaker, which is typical of the techniques used to secure larger area screens in such machines,

Fig. 10 is a perspective view of a metal reinforcing structure embodying the invention in which the perimeter reinforcing frame is of rectangular box section, and

Fig. 11 is a similar view of the completed screen frame after encapsulated in a plastics or GRP material in which the near side corner is cut away to reveal the reinforcing wires and box section perimeter reinforcement.

In Fig. 1 a known support frame is shown comprising a welded grid of reinforcing wires generally designated 10 (and best seen in Fig. 3) embedded in a moulded rectilinear structure defining an external rectilinear flange 12 and a grid of orthogonally intersecting ribs, two of which are denoted in Fig. 1 by 14, 16. Layers of woven wire mesh such as 19, 21, 23 are laid over, tensioned and secured to the frame in manner known per se.

The upper edges of the ribs 14, 16 are triangular in cross-section as best seen in Fig. 2 which shows the inner core of plastics material 18 embedding one of the upper layer of wires 20 and the smooth hard wearing outer skin of plastics material 22.

As best seen in Fig. 1 two wires extend through each rib, an upper wire 20 and a parallel lower wire 24.

The lower wires such as 24 are bent up and welded to the upper wires at opposite ends of each wire run, and (although not shown in Fig. 3) also along each of the two longer sides of the reinforcing framework, as depicted at 26. The double thickness of wire extending into the end and side flanges of the eventual frame have been found to provide sufficient rigidity to the flanges for the smaller area screens such as are employed in the Rig Technology Ltd VSM range of shakers.

Fig. 4 is a cross-section through the rib 16 of Fig. 1.

Figs. 5 and 6 shows alternative reinforcements for the ribs as proposed in accordance with different aspects of the present invention, namely a flat bar 28 in Fig. 5 or an I-beam section bar 30 in Fig. 6.

Fig. 7 shows how the flange 12 can be replaced in accordance with the first aspect of the present invention, by a metal box section structure 32. As shown in Fig. 7 the cross-section of 32 may be square, but other cross-section shapes are possible such as rectangular or triangular.

Fig. 8 shows how a screen 33 such as one constructed as shown in Figs. 1 - 3 can be secured in a shaker box 35 which is shown cut away in Fig. 8. The box includes parallel side walls one of which is denoted by 34, an end wall 36, and two parallel lower rails 38, 40 on which the side flanges (such as 12) of the screen can slide, (to allow the screen to be slid in and out of the box) and on which the side flanges rest.

Upper rails 42, 44 are parallel to but spaced from the lower rails 38, 40 and an inflatable tube 46 is sandwiched between the upper surface of the side and end flanges of the frame of the screen 33. Deflating the tube 46 allows the screen 33 to be slid in and out of the box. Inflating the tube 46 after the screen is in place (as shown) secures the screen in the box and also seals the edges of the screen to the sides of the box to prevent fluid leakage around the edges of the screen.

Another method of securing screen in shaker boxes is shown diagnozmatically in Fig. 9. Here the opposite side edges 48, 50 of a screen 52 are clamped between a lower supporting structure shown in dotted outline at 54, 56 and 58 and two wedges 60, 62. These are driven into position and wedged between blocks 64, 66 which extend laterally inwardly from the inner faces of the side walls 68, 70 of the shaker box.

The rear wall of the box is shown at 72 and a front wall at 74. The latter provides the support for one longer edge of the screen, while the structure 56 provides support for the other longer edge of the screen.

The wedges 60, 62 ensure that the side edges of the screen are sealed to the sides of the supporting structure 54, 58, but unless the screen structure is sufficiently rigid as to prevent flexing and whipping, the seal between the longer edges of the screen and the front and rear supports 74, 56 therefor, can be broken in use, allowing fluid to seep around the longer edges of the screen. The junction between two of the edges in question is shown at 76 in Fig. 6.

A reinforcing frame constructed in accordance with the first aspect of the present invention is shown in Fig. 10. Here the two layers of orthogonal intersecting wires of the arrangement shown at 10 in Fig. 3 extend between a rectangular metal box section bounding frame 78, 80, 82, 84. As shown the ends of the wires are welded to the upper and lower surfaces of the box section members 78 - 84.

After moulding in suitable tooling, the wires and bounding frame are encapsulated in plastics material, preferably a glass reinforced plastics material, to form a finished frame such as is shown in Fig. 11, albeit partly cut away to reveal the wires and box section bounding frame.

1/3

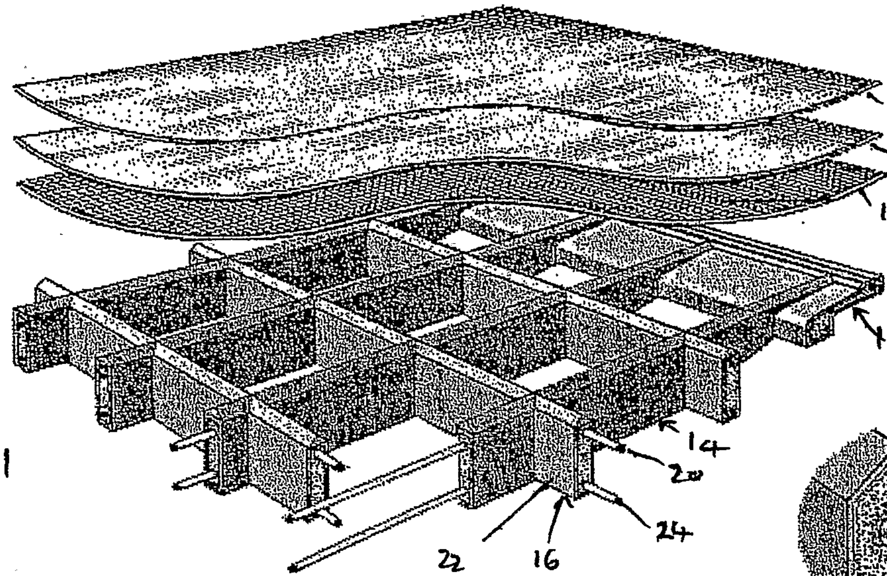


Fig 1

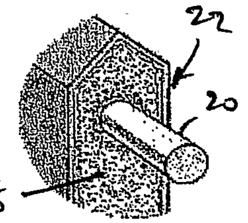


Fig 2

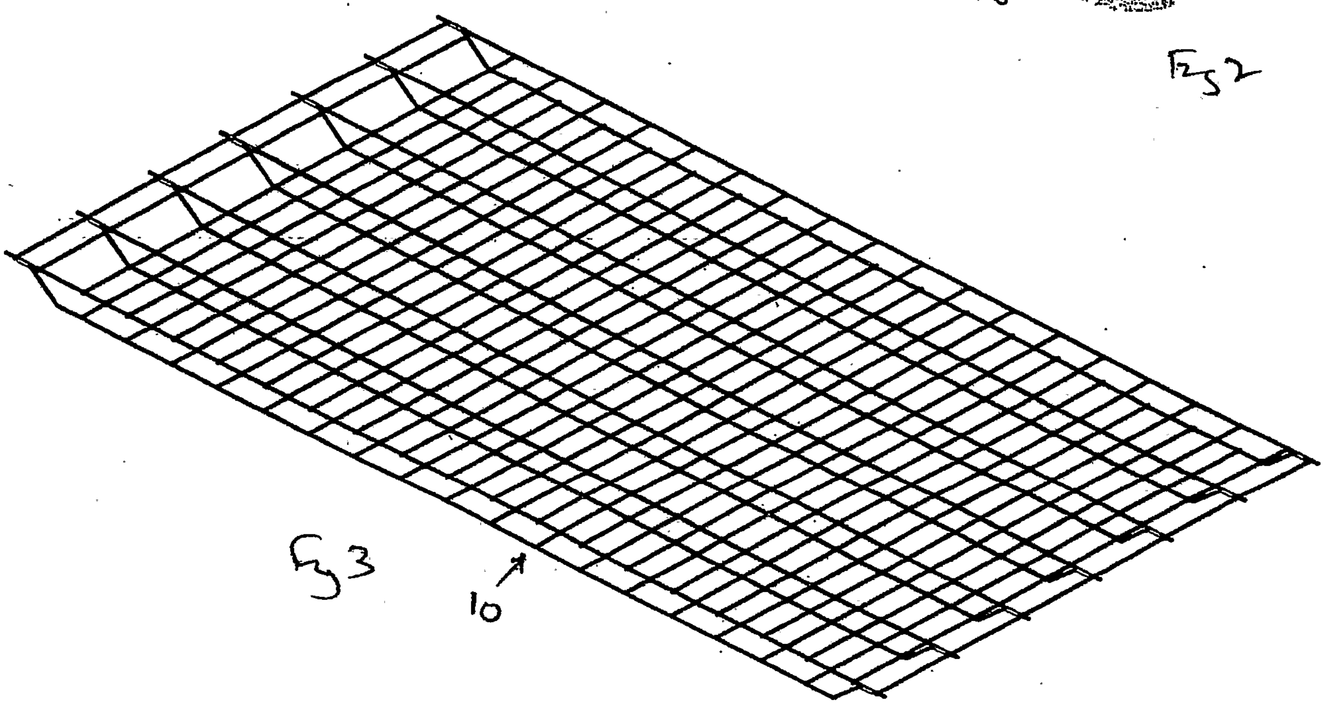
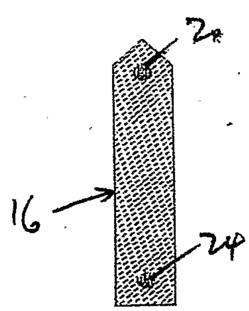
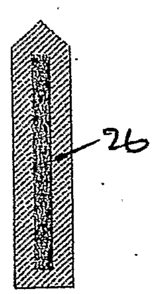


Fig 3



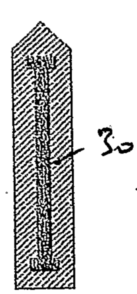
Present Structure

Fig 4



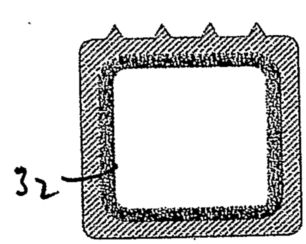
Flat Bar Structure

Fig 5



I-Beam Structure

Fig 6



Box Section Structure

Fig 7

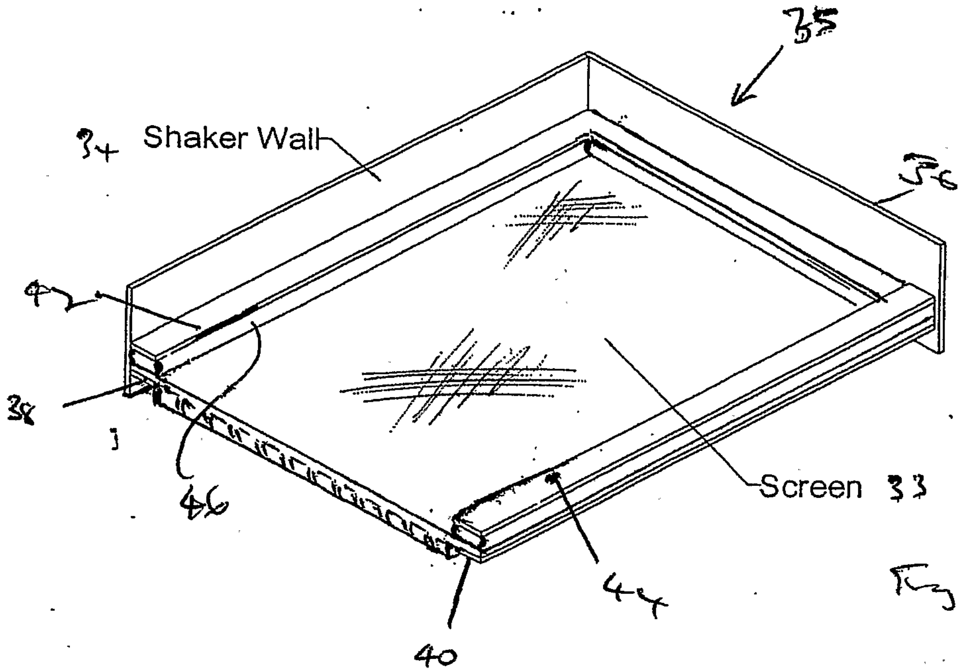

35
34
Shaker Wall
36
42
38
46
Screen 33
44
40

Fig 8

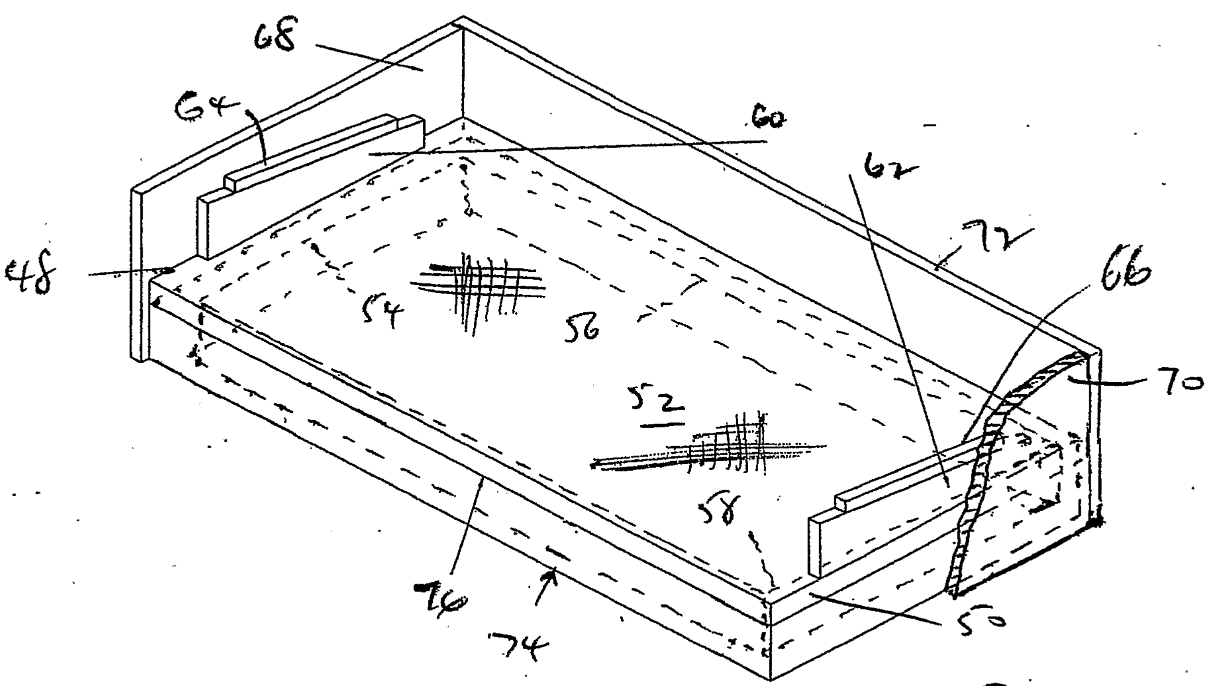

68
64
60
62
72
66
48
54
56
52
70
58
76
74
50

Fig 9

3/7

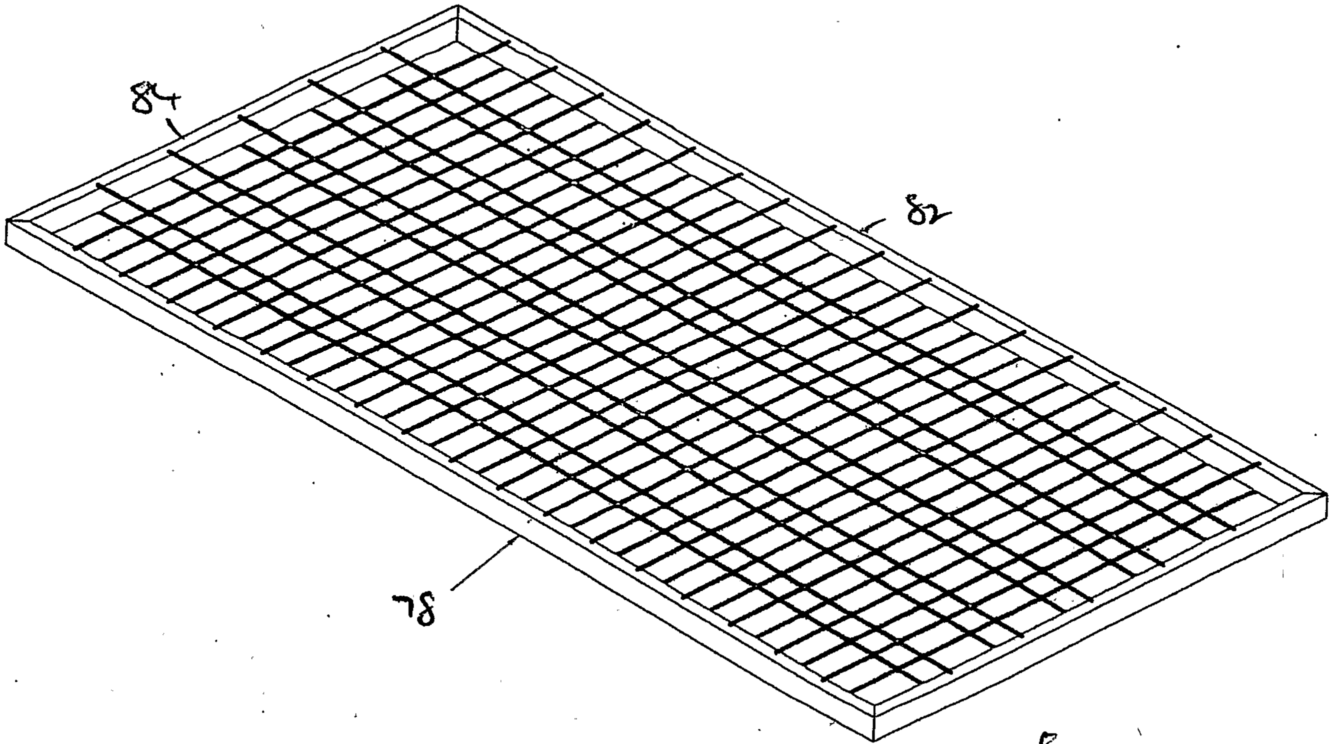


Fig 10

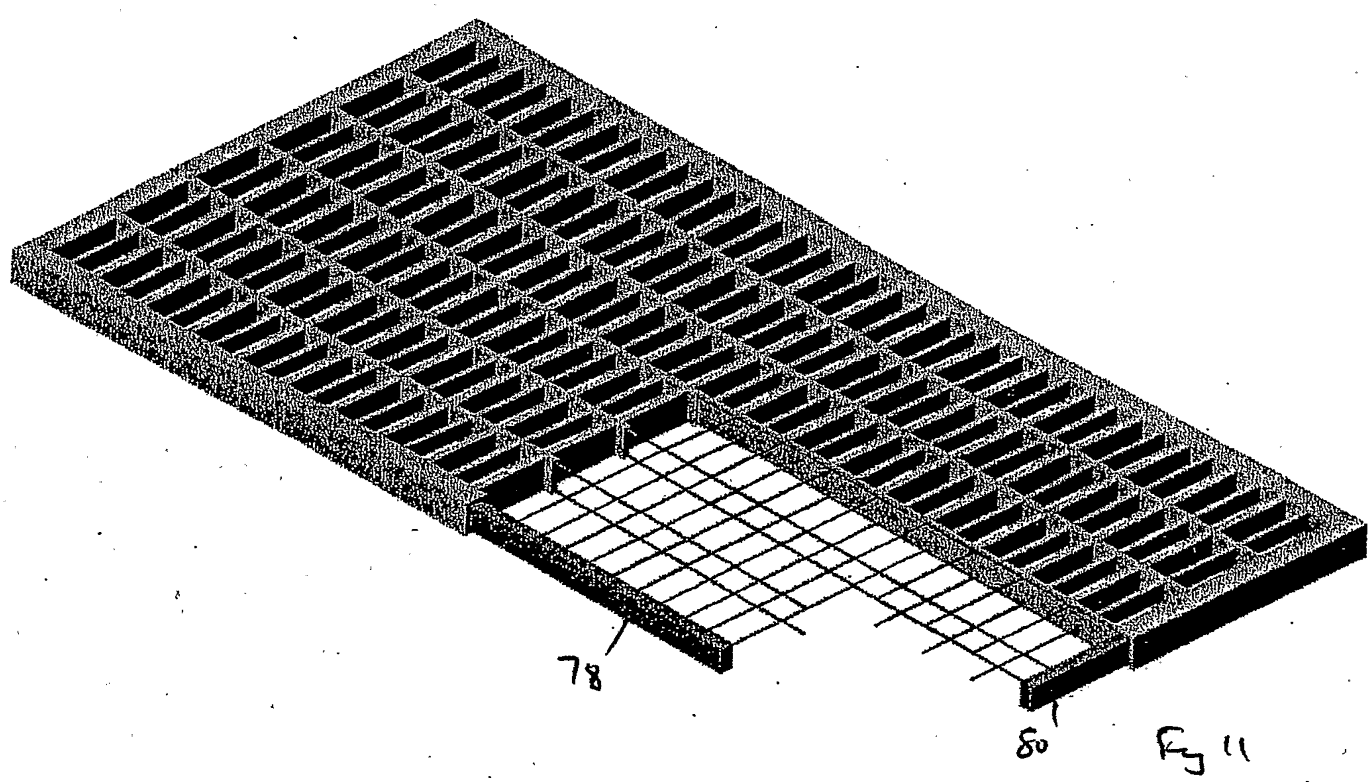


Fig 11